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(54) **DOWNHOLE CONNECTOR FOR PRODUCTION TUBING AND CONTROL LINE AND METHOD**

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(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

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Related U.S. Application Data

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(51) **Int. Cl.**[7] **E21B 47/00**
(52) **U.S. Cl.** **166/250.08**; 166/375
(58) **Field of Search** 166/250.01, 250.08, 166/336, 337, 55, 377, 297, 373–375

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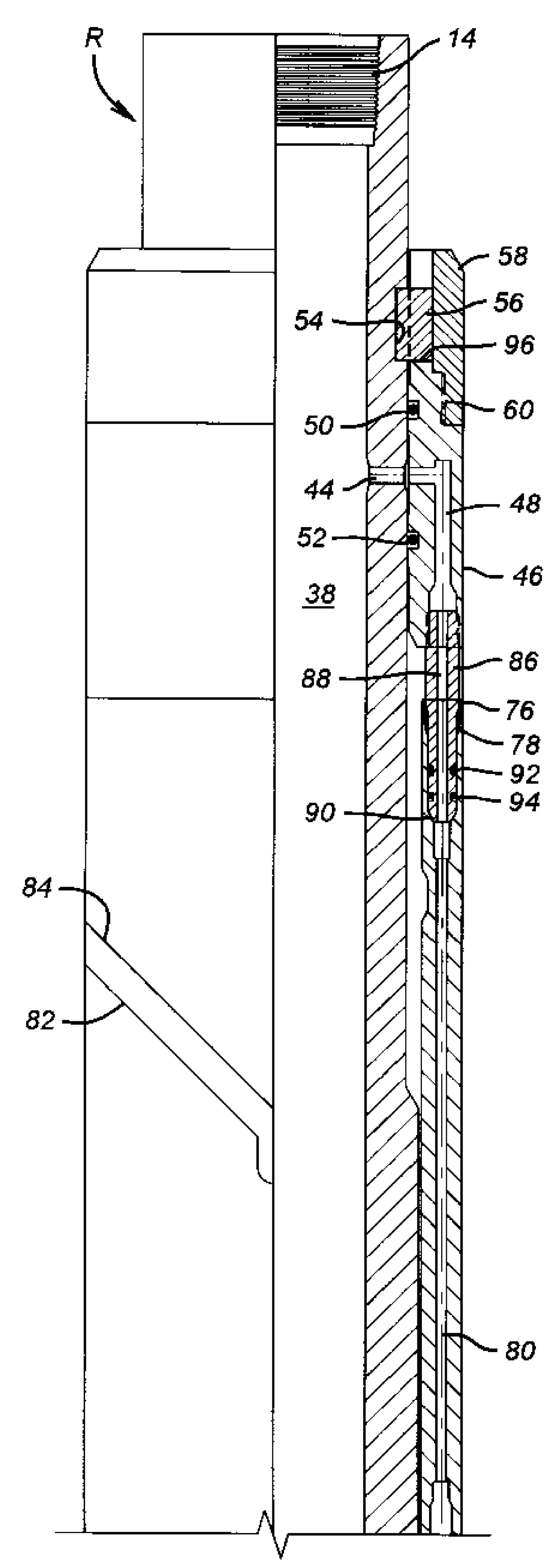
(57) **ABSTRACT**

A connector is disclosed to facilitate the testing of a control line or lines adjacent a bottomhole assembly. A running tool is connected to a lower portion of the connector which is, in turn, connected to the bottomhole assembly. The running tool allows testing of the control line adjacent the bottomhole assembly and thereafter, the operation of components of the bottomhole assembly. The running tool is removed and the upper portion of the string, including the mating portion of the connector at its lower end, is inserted into the wellbore. The connector components are self-aligning and lock to each other downhole to complete the production tubing and the control line tubing to the surface. Multiple control lines are envisioned between the surface and the bottomhole assembly. Multiple connectors can be used in a given production string, and provisions can be made for operation of a multiplicity of downhole components from the control line system which extends along the production tubing.

20 Claims, 10 Drawing Sheets



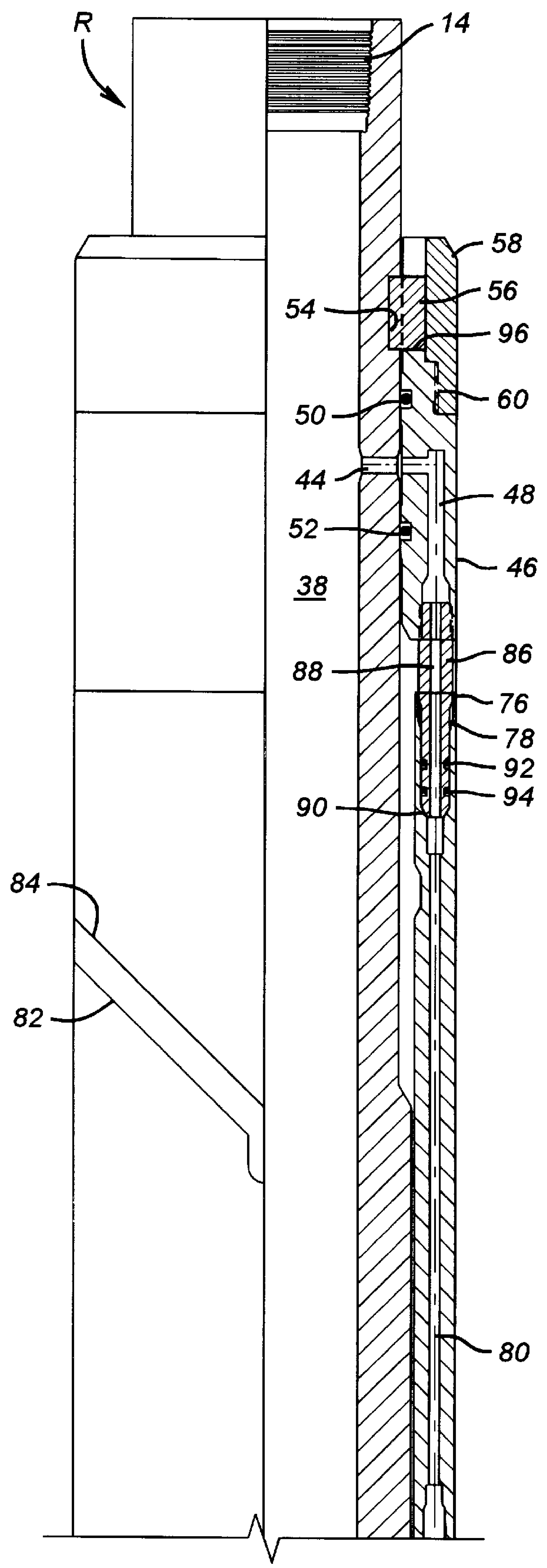


FIG. 1a

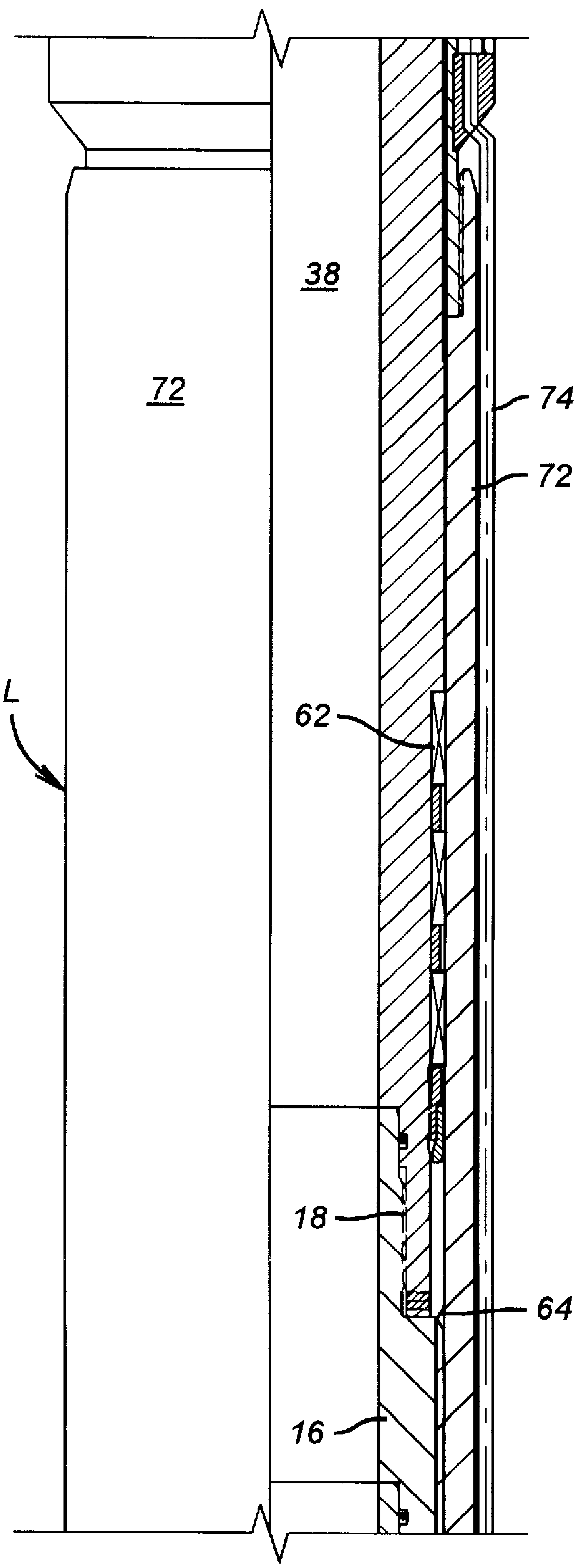


FIG. 1b

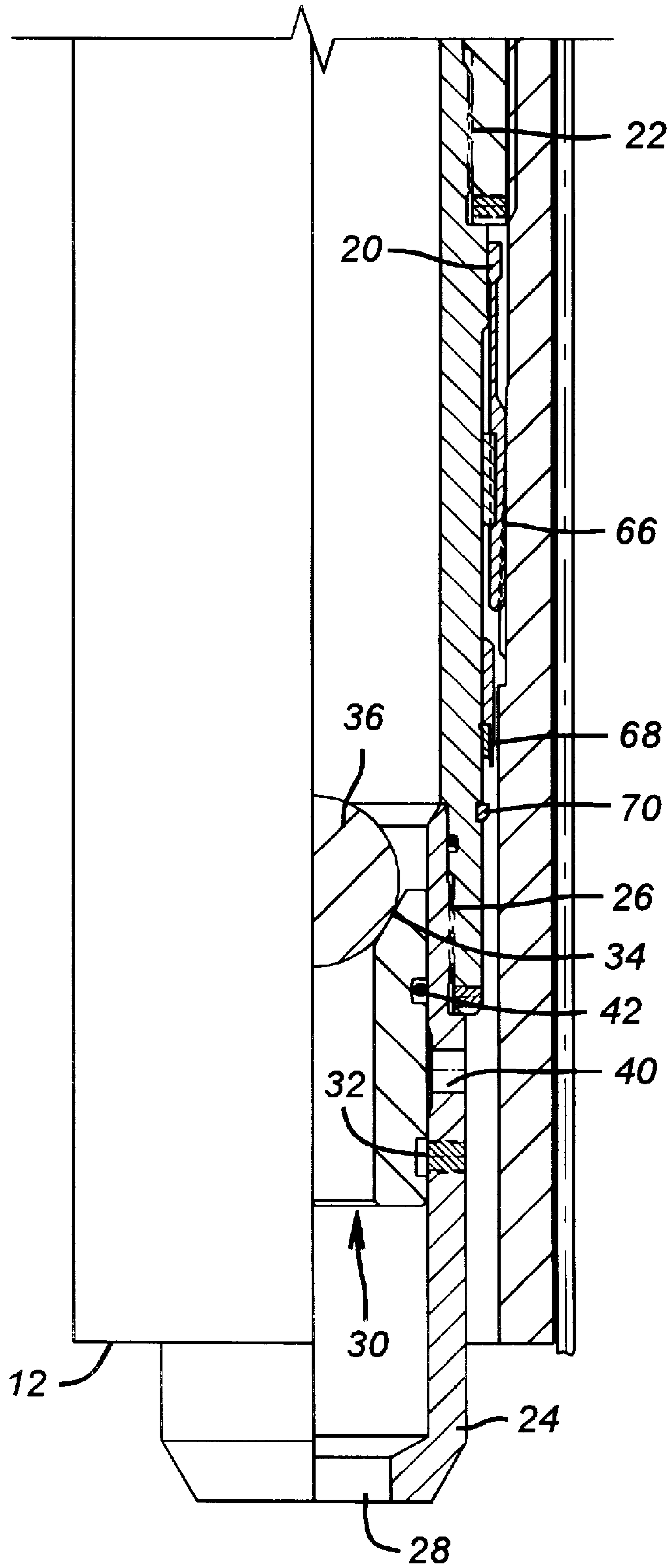


FIG. 1c

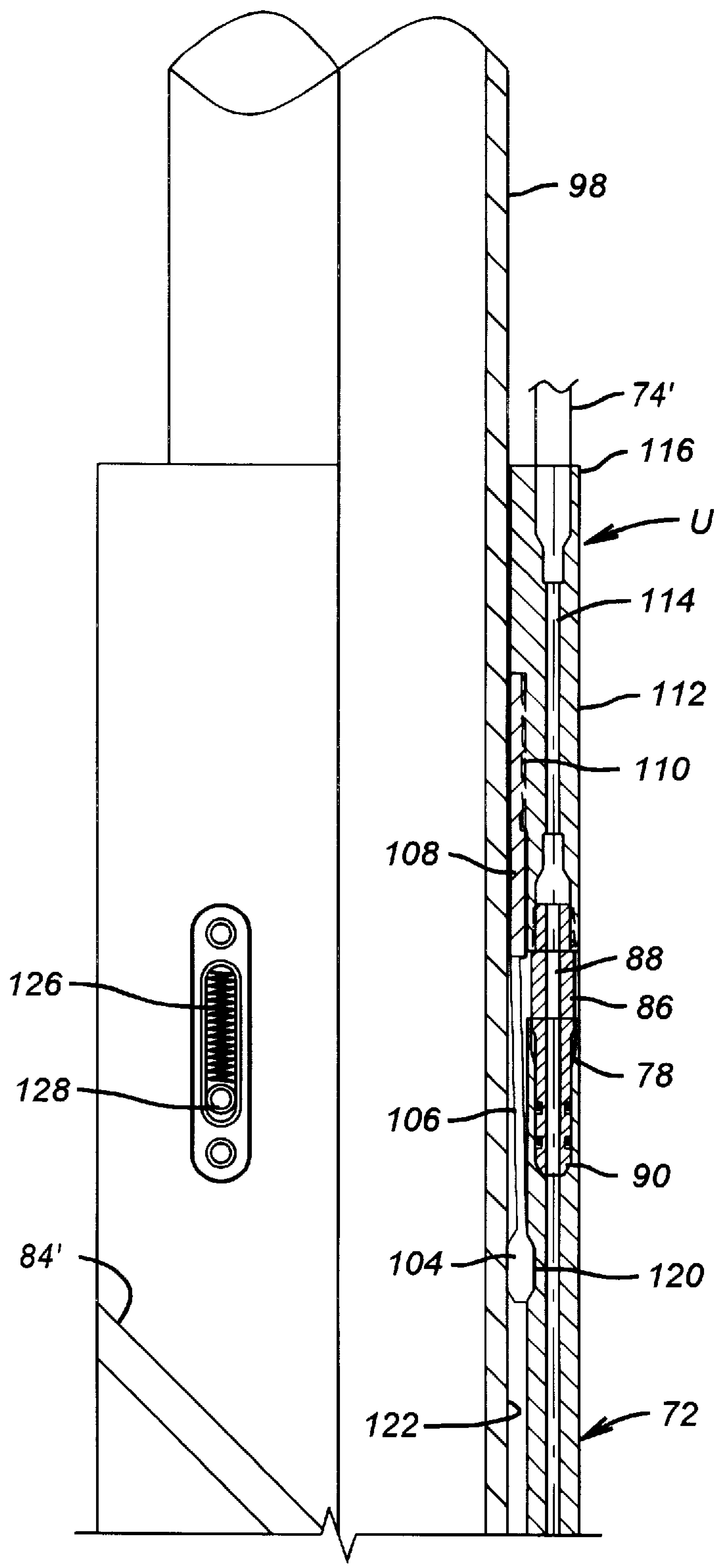

98
74'
116
U
114
112
110
108
88
86
78
126
128
106
90
84'
104
120
122
72

FIG. 2a

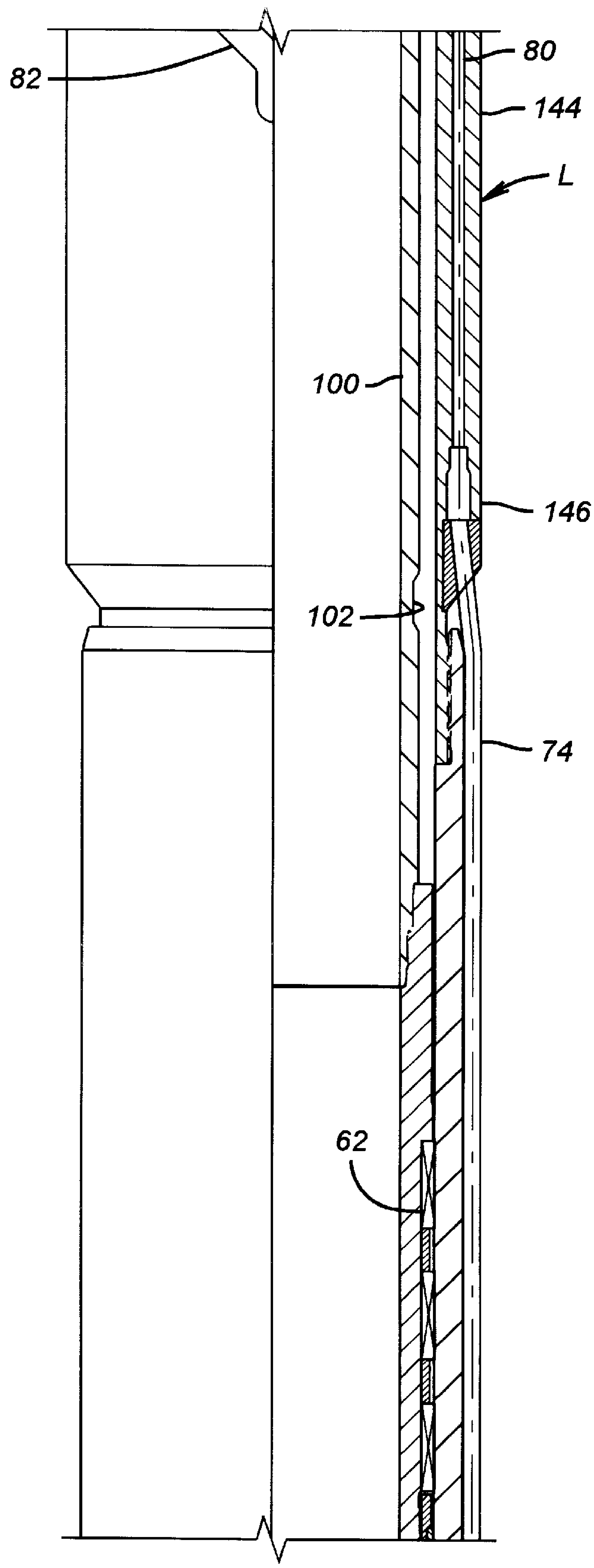


FIG. 2b

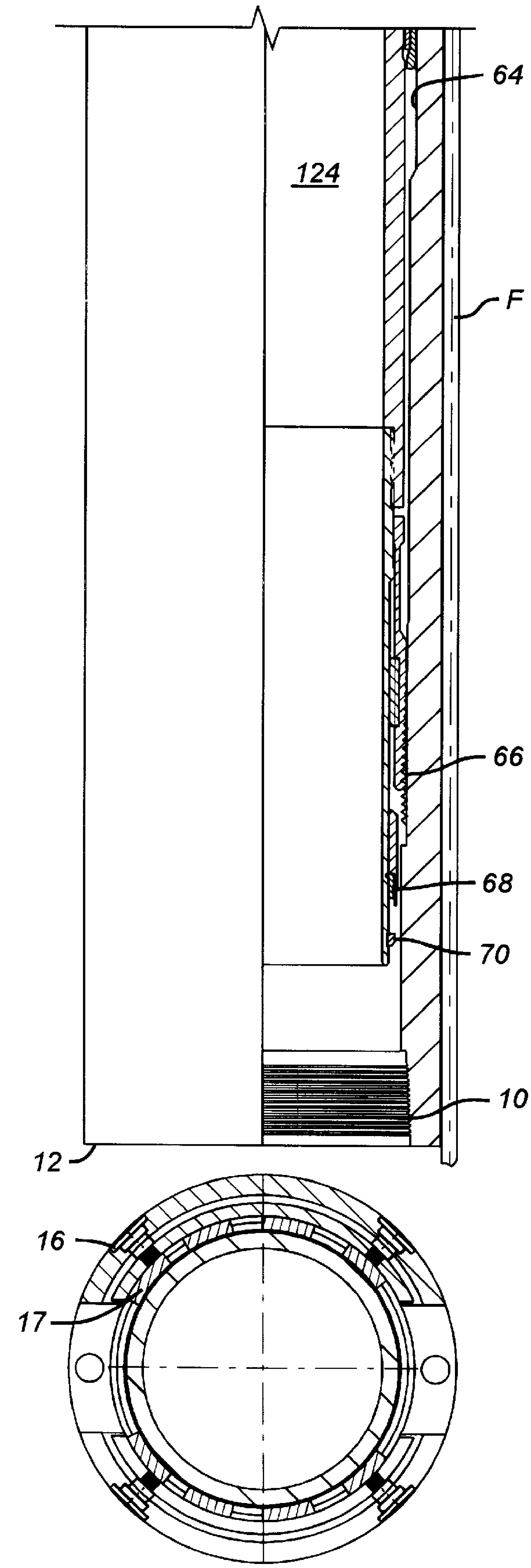


FIG. 2c

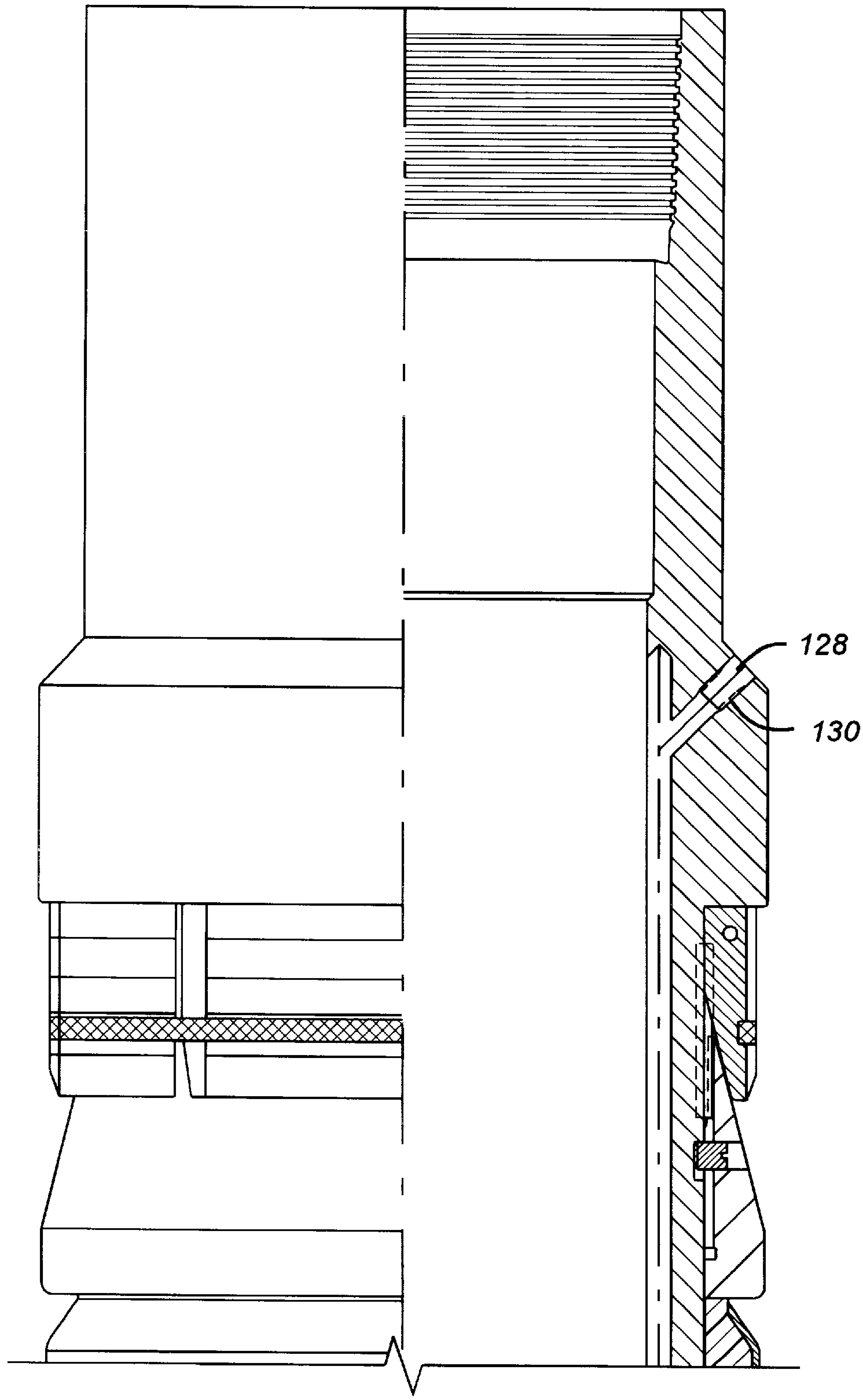


FIG. 3a

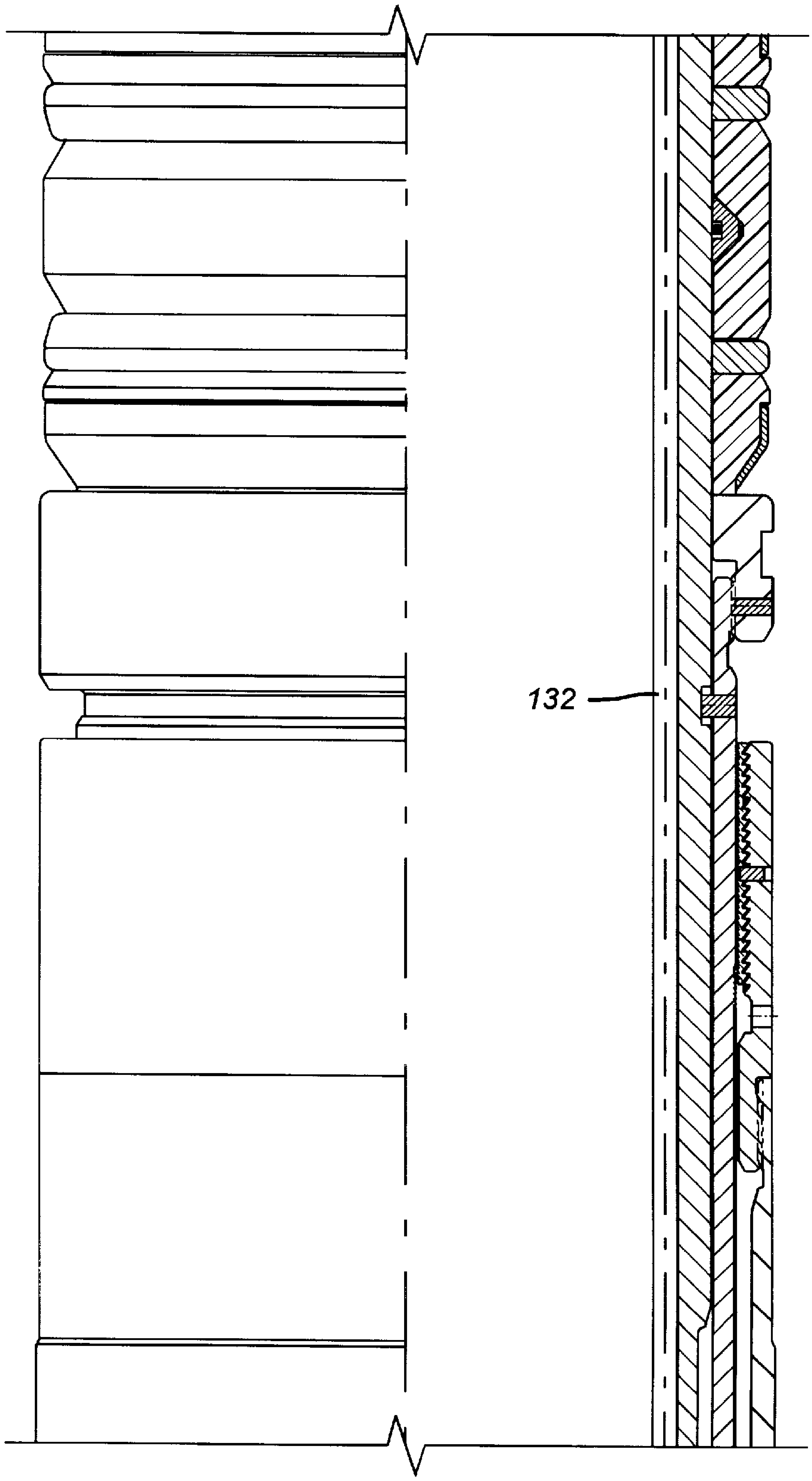


FIG. 3b

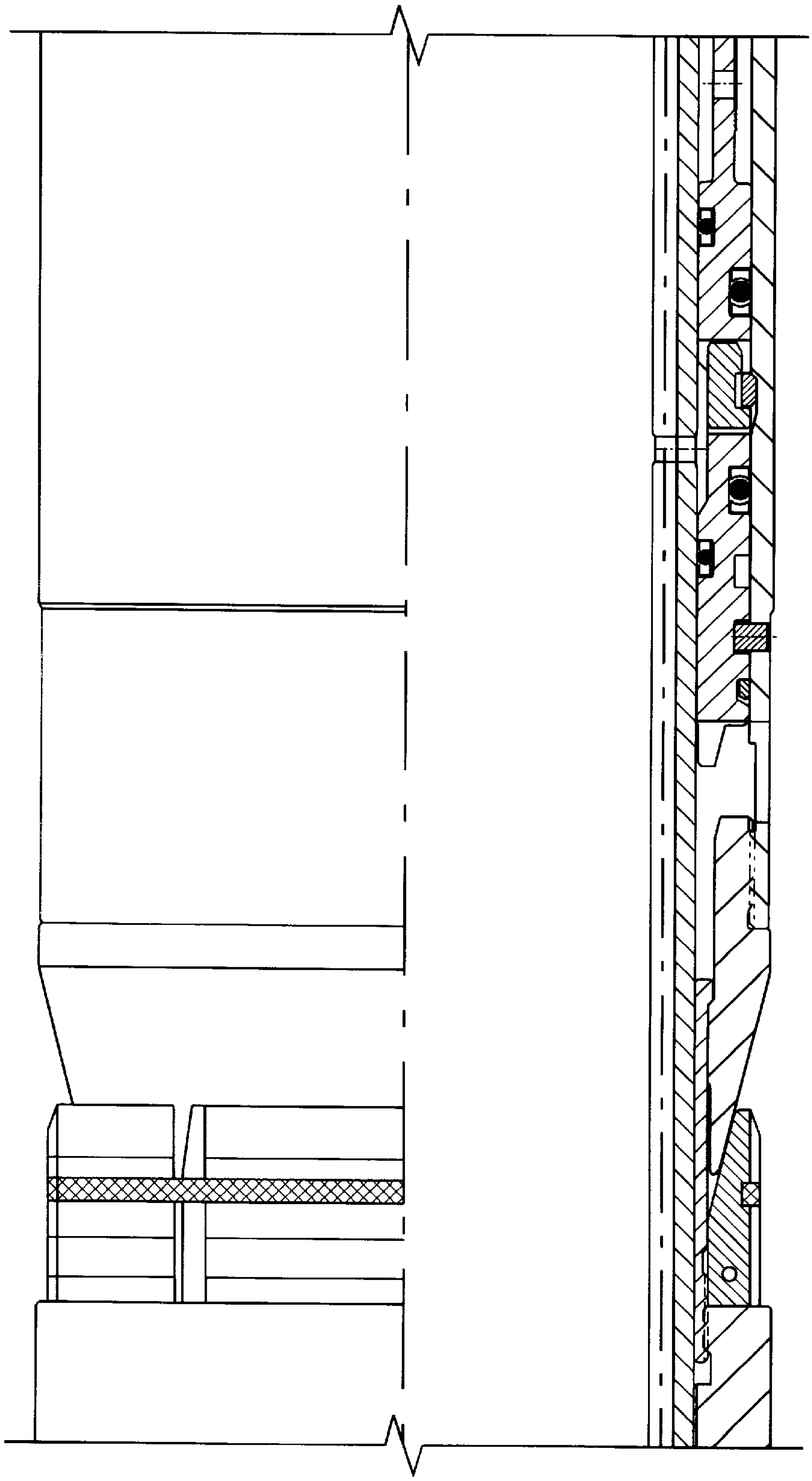


FIG. 3c

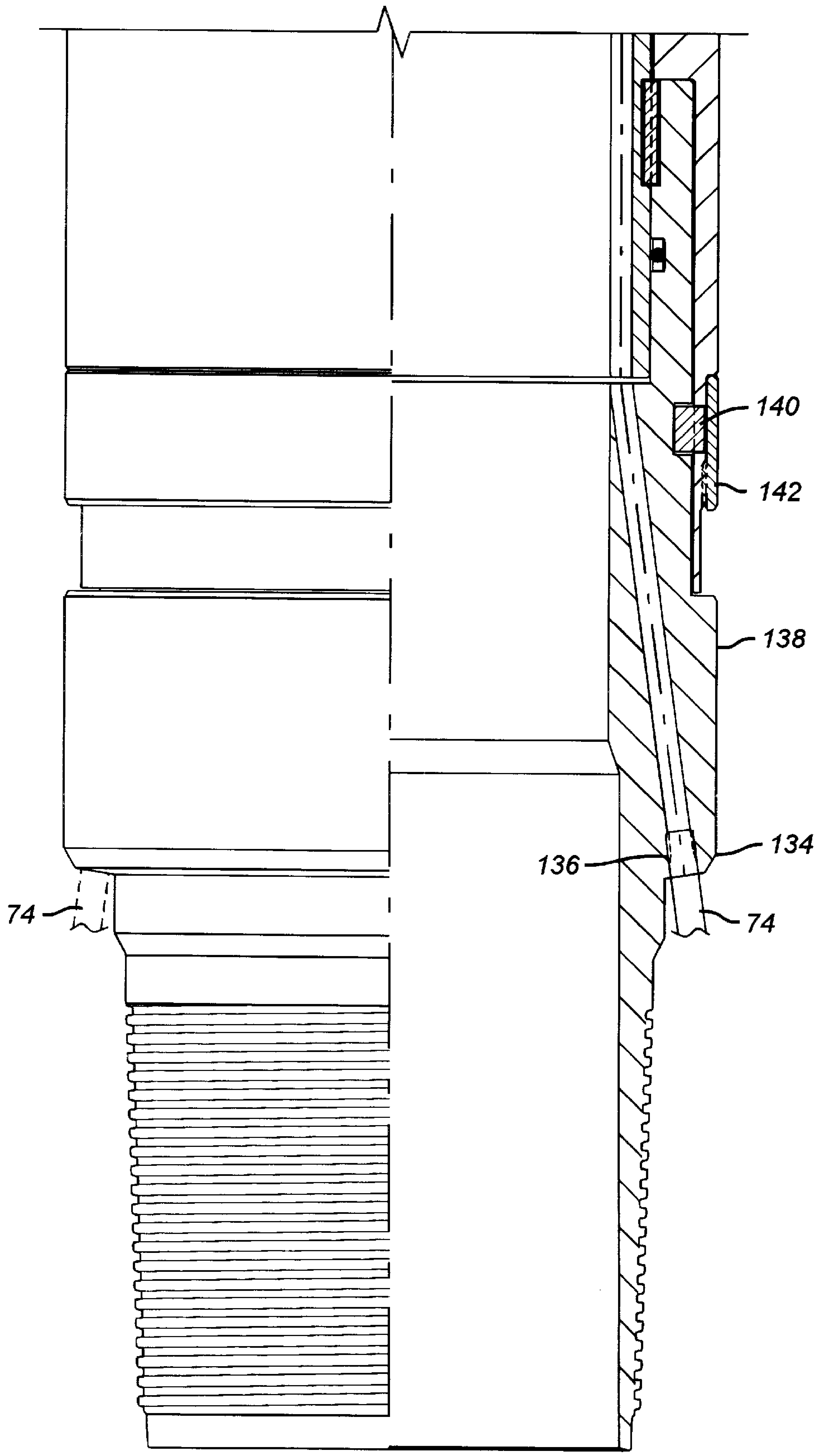


FIG. 3d

DOWNHOLE CONNECTOR FOR PRODUCTION TUBING AND CONTROL LINE AND METHOD

This application claims the benefit of U.S. Provisional Application No. 60/072,934, filed on Jan. 29, 1998.

FIELD OF THE INVENTION

The field of this invention relates to the make-up of bottomhole assemblies on a tubing string, in conjunction with one or more control lines extending from the surface to the bottomhole assembly, and methods for assembly and test of such systems.

BACKGROUND OF THE INVENTION

Control lines have been attached to production tubing for operation of a variety of downhole components. Typically, the control line is assembled to the production tubing for running into the well together. If rigid tubing is used, the production string is made-up to position the bottomhole assembly at the desired depth, in conjunction with the attachment of the control line or control lines. It is only when the bottomhole assembly is fully positioned at the desired location downhole that the integrity of the control line can be first tested. Thus, when the bottomhole assembly is finally positioned and the control line is tested and a problem arises, the entire production string up to the bottomhole assembly must be removed from the wellbore in an effort to determine where leakage has occurred. What has been lacking in these techniques is the ability to primarily position the bottomhole assembly at the desired location and test portions of the control line adjacent to the bottomhole assembly while the bottomhole assembly is in position downhole. Accordingly, one of the objects of the present invention is to allow the flexibility of testing the portion of the control line where leakage is most likely to occur, i.e., adjacent the bottomhole assembly, where there are more joints in the system.

Another objective of the present invention is to facilitate the assembly of a control line system which extends from the surface down to the bottomhole assembly and back up again along the production tubing to the surface. With such a layout, fiber optic technology can be used to insert, through the control line, a fiber optic cable which extends from the surface to the bottomhole assembly and back to the surface. The positioning of such a fiber optic cable in the control line allows well conditions to be monitored from the surface on a real-time basis. Thus, when a particular zone produces water and its temperature drops, the fiber optic cable can sense this occurrence and its position so that surface personnel can take appropriate corrective action. The control line connection system can be used for numerous other applications. This with a fiber optic cable is just one example of how a U-shaped control line can be used.

The objective of the connector of the present invention is to also allow as many branch connections as necessary so that multiple downhole devices can be operated as required. The connector also allows, through the use of a running tool, an opportunity to not only test the control line adjacent the bottomhole assembly, but also to operate certain components of the bottomhole assembly through the running tool, whereupon the running tool can be removed and the remainder of the string connected to the bottomhole assembly through the unique connector. These and other advantages will become more apparent to those of ordinary skill in the art from a review of the description of the connector and the method below.

SUMMARY OF THE INVENTION

A connector is disclosed to facilitate the testing of a control line or lines adjacent a bottomhole assembly. A running tool is connected to a lower portion of the connector which is, in turn, connected to the bottomhole assembly. The running tool allows testing of the control line adjacent the bottomhole assembly and thereafter, the operation of components of the bottomhole assembly. The running tool is removed and the upper portion of the string, including the mating portion of the connector at its lower end, is inserted into the wellbore. The connector components are self-aligning and lock to each other downhole to complete the production tubing and the control line tubing to the surface. Multiple control lines are envisioned between the surface and the bottomhole assembly. Multiple connectors can be used in a given production string, and provisions can be made for operation of a multiplicity of downhole components from the control line system which extends along the production tubing.

BRIEF DESCRIPTION OF THE DRAWING

FIGS. **1***a–c* are a sectional elevational view of the outer or lower portion of the connector with the running tool inserted therein.

FIGS. **2***a–c* show both portions of the connector in sectional elevation connected to each other.

FIGS. **3***a–d* show a passage around a packer in sectional elevational view, indicating the path of the control line around the packer sealing and gripping assemblies.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1***a–c*, the running tool R is shown fully inserted into the lower body L of the connector C. The lower body L has a thread **10** at its lower end **12**, which is best seen in FIG. **2***c*. Thread **10** is connected to the bottomhole assembly, which is not shown. This bottomhole assembly can include packers, sliding sleeves, and other types of known equipment.

The running tool R is made up of a top sub **14**, which is connected to a sleeve **16** at thread **18**. Sleeve **16** is connected to sleeve **20** at thread **22**. Sleeve **20** is connected to bottom sub **24** at thread **26**. Bottom sub **24** has a bottom passage **28**, as well as a ball seat assembly **30**. The ball seat assembly **30** is held to the bottom sub **24** by shear pin or pins **32**. Although a shear pin or pins **32** are shown, other types of breakable members can be employed without departing from the spirit of the invention. The ball seat assembly **30** has a tapered seat **34** to accept a ball **36** to build pressure in internal passage **38**. Bottom sub **24** also has a lateral port **40** which, in the position shown in FIG. **1***c*, is isolated from the passage **38** by virtue of O-ring seal **42**. Those skilled in the art will appreciate that during run-in, the ball **36** is not present. Accordingly, passage **38** has an exit at the passage **28** so that the bottomhole assembly, which is supported off the lower end of the lower body L, can be run in the hole while circulation takes place. Eventually, the bottomhole assembly is stabbed into a sump packer (not shown), which seals off the circulation through passage **38**. It is at that time that the ball **36** can be dropped onto seat **34** to close off passage **38**. At that time, O-ring **42** prevents leakage through the port **40**, allowing pressure to be built up in passage **38** above the ball **36**. This pressure can be communicated through a lateral port **44**, as seen in FIG. **1***a*, into orientation sub **46**. Orientation sub **46** has a passage which makes a right-angle turn **48** extending therethrough. Seals **50** and **52** prevent leakage between orientation sub **46** and the running tool R.

The running tool R also has a groove **54** to accept a dog **56** which is held in place by assembly of retaining cap **58**, as will be described below. When retaining cap **58** is secured to orientation sub **46** at thread **60**, with dog **56** in place in groove **54**, the running tool R is locked in position with respect to orientation sub **46**.

Looking further down the running tool R as shown in FIG. **1***b*, a seal assembly **62** encounters a seal bore **64** to seal between the lower body L and the running tool R. A locking ratchet assembly **66**, of a type well-known in the art, is located toward the lower end of the running tool R. The ratchet teeth in a known manner allow the running tool R to advance within the lower body L but prevent removal unless a shear ring **68** is broken when contacted by a snap ring **70** after application of a pick-up force.

The lower body L includes a tubular housing **72** which, as previously stated, has a lower end **12** with a thread **10** for connection of the bottomhole assembly. In the preferred embodiment, a pair of control lines, only one of which **74** is shown, run longitudinally along the length of the tubular housing **72**. The control line **74** terminates at an upper end **76** with a receptacle **78**. In order to make the control line connection, the control line **74** becomes a passage **80** prior to the termination of passage **80** in the receptacle **78**. Passage **80** is shown in alignment with passage **48**. This occurs because when the running tool R is made up to the lower body L, preferably at the surface, an alignment flat **82** engages a similarly oriented alignment flat **84**. Alignment flat **82** is on the housing **72**, while alignment flat **84** is on communication crossover **86**. The crossover **86** contains a passage **88** which is an extension of passage **48**. Passage **88** terminates in a projection **90**, which is sealed into the receptacle **78** by O-rings **92** and **94**, which are mounted to the projection **90**. Although O-rings **92** and **94** are shown, other sealing structures are within the scope of the invention. In essence, the receptacle **78** has a seal bore to accept the seals **92** and **94**. The orientation of the opposed flats **82** and **84** ensure that the crossover **86** rotates to orient the projection **90** in alignment with receptacle **78** as the crossover **86** is advanced over the running tool R. To complete the assembly after proper alignment, the running tool R is firmly pushed into the lower body L so that the seal **62** engages seal bore **64**, and the locking ratchet assembly **66** fully locks the running tool R to the lower body L. At this time, the crossover **86**, which is made up over the running tool R and is now properly aligned, has its projection **90** progress into the receptacle **78**. Thereafter, the projection **90** is fully advanced into a sealing relationship into the receptacle **78** so that its passage **48** is in alignment with port **44**. This orientation is ensured by alignment of a window **96** in the orientation sub **46** with the groove **54** on the top sub **14** of the running tool R. When such an alignment is obtained, the dog **56** is pushed through window **96** so that it partially extends into the window and partially into groove **54**. At that time, the retaining cap **58** is threaded onto thread **60** to secure the position of the dog **56**, which, in turn, assures the alignment of port **44** with passage **48**. The running tool R is now fully secured to the lower body L of the connection C. Rigid or coiled tubing can now be connected to the running tool R at thread **14**.

The bottomhole assembly (not shown), which is supported off the lower end **12** of the body **72**, can now be run into position in the wellbore while circulation continues through passage **38** and outlet **28**. Ultimately, when the bottomhole assembly is stabbed into a sump packer, circulation ceases and a signal is thus given to surface personnel that the bottomhole assembly has landed in the desired position. At that time, the ball **36** is dropped against the seat **34**, and pressure is built up in passage **38** above ball **36**. This pressure communicates laterally through port **44** into passage **48** and, through the sealed connection of the projection **90** in the receptacle **78**, the developed pressure communicates into the control line **74** to the bottomhole assembly. Since, in the preferred embodiment, there are actually a pair of control lines **74**, there are multiple outlets **44** in the running tool R such that all the control lines **74** going down to the bottomhole assembly and making a U-turn and coming right back up adjacent the tubular housing **72** and terminating in a similar connection to that shown in FIG. **1***a*, are all pressure-tested simultaneously. If it is determined that there is a loss of pressure integrity in the control line system **74** at this point, the bottomhole assembly can be retrieved using the running tool R or alternatively, the running tool R can be released from the lower body L and the bottomhole assembly can be retrieved in a separate trip. If, on the other hand, the integrity of the control line system **74** is acceptable, pressure can be further built up in passage **38** to blow the ball **36**, with the ball seat assembly **30**, into the bottom of bottom sub **24** where they are both caught. As a result, the port **40** is exposed so that pressure can be communicated to the bottomhole assembly for operation of its components, such as a packer or a sliding sleeve valve, for example. Once the bottomhole assembly is completely functioned through the pressure applied at port **40**, an upward force is applied to the running tool R to break the shear ring **68** so that the entire assembly of the running tool R, along with the orientation sub **46** and the crossover **86**, can be removed. As this pick-up force is applied, the projection **90**, which is a component of the crossover **86**, comes out of the receptacle **78** so that each of the control lines **74** (only one being shown) becomes disconnected as the running tool R is moved out completely from the lower body L.

At this point the upper string **98**, shown in FIG. **2***a*, which is connected to the upper body U, can be run in the wellbore for connection to the lower body L. Alternatively, the upper string **98** can be inserted at a much later time.

The upper body U has some constructional differences from the orientation sub **46** and the crossover **86** used in conjunction with the running tool R. Whereas the components **46** and **86** were assembled by hand at the surface, the counterpart components of the upper body U must connect automatically to the lower body L. Those skilled in the art will be appreciate that the view in FIGS. **2***a–c* is the view of the upper body U fully connected into the lower body L. However, there are certain components that are in a different position as the upper body U approaches the lower body L. The string **98** extends as a mandrel to support the upper body U and has numerous similarities to the running tool R which will not be repeated in great detail at this point. A seal assembly **62** contacts a seal bore **64**, while a locking mechanism of the ratchet type **66** is employed in upper body assembly U, just as in the running tool R. Also present is a shear release in the form of an L-shaped ring **68**, which for release is broken by a snap ring **70**. The mandrel **100**, which forms an extension of the upper string **98**, includes an outer groove **102**. During the initial run-in, a series of collet heads **104** is initially in alignment with groove **102**. These collet heads **104** are held securely in groove **102** by sleeve **17** (shown in section in FIG. **2***c*). Sleeve **17** is pushed into this position by spring **126**. The collet heads **104** extend from a series of long fingers **106**, which in turn extend from a ring **108**. Ring **108** is connected at thread **110** to orientation sub **112**. Orientation sub **112** has a passage **114**, including an upper end **116** which one of the accepts the control lines **74'** which run from the surface to upper end **116** along the upper string **98**. Again, it should be noted that a plurality of control lines **74** and **74'** are contemplated so that when the upper body U is connected to the lower body L, more than one control line connection is made simultaneously. As previously stated, the control line from the surface **74'** extends down to the upper end **116** and then becomes passage **114**. A crossover **86** has a passage **88** which is in alignment with passage **114**. As before, the alignment flat **82** on the tubular housing **72** engages an alignment flat **84'** on the crossover **86**. However, rotational movement about the longitudinal axis is still possible while the collet heads **104** are longitudinally captured in groove **102**. This ability to rotate while longitudinally trapped allows the mating flats **82** and **84'** to obtain the appropriate alignment so that ultimately, passage **80** can be connected to passage **88** as the projection **90** enters the receptacle **78**, as described above. As this is occurring, the groove **102**, with the collet heads **104** longitudinally trapped to it, comes into alignment with groove **120**, thus allowing the collet heads **104** to enter groove **120** and subsequently become locked in groove **120** as a result of opposing surface **122**. This is precisely the position shown in FIGS. **2***a* and **2***b*. Thus, as the connection is firmly made up connecting passage **114** to passage **80** by virtue of a sealed connection between the projection **90** and the receptacle **78**, that position is locked into place as collet heads **104** become trapped against longitudinal movement into groove **120** which is on the tubular housing **72** of the lower body L. It is at that time that further longitudinal advancement of the upper string **98** allows the seal **62** to enter the seal bore **64** and ultimately the locking assembly **66** to secure the mandrel **100** to the lower housing **72**. Thus, with seal assembly **62** functional, production can take place through the passage **124** in the mandrel **100**. The seal assembly **62** in effect prevents leakage between the mandrel **100** and the tubular housing **72**, which is a part of the lower body L.

When disconnecting, collet **104** drops into groove **102**, and the connection alignment sub **112** and housing **72** start to move apart. To ensure the collet **104** remaining in the groove **102**, sleeve **17** (shown in section in FIG. **2***c*) is pushed over the collet **104** by spring **126**, locking it in place in the groove **102**. The reverse procedure happens when reconnecting.

As shown in FIG. **2***c*, the control line **74** extends beyond the lower end **12** and can extend through a packer as illustrated in FIGS. **3***a–d*. The control line **74** is literally inserted into opening **128** and secured in place with a jam nut (not shown) threaded into threads **130**. The control line **74** extends through a passage **132** and emerges out at lower end **134**, where a jam nut (not shown) is secured to threads **136**. To facilitate manufacturing, the lower end of the passage **132** extends through a sleeve **138**. The passage through the sleeve **138** is aligned with the main passage **132** and the aligned position is secured by a dog **140**, which is locked in position by a ring **142**. Also shown in FIG. **3***d* in dashed lines is the return control line from the bottomhole assembly going back up to the surface, which passes through the packer shown in FIGS. **3***a–d* in a similar manner and preferably at 180° to the passage **132** which is illustrated in the part sectional view. The control line **74** shown in dashed lines comes back up into the lower body L and is connected to the upper body U in the manner previously described.

Those skilled in the art will appreciate that what has been shown is a simple way to test the control line **74** adjacent the bottomhole assembly without running the upper string **98** with its attendant control line segments. Once the lower portion of the control line **74** has been tested and determined to be leak-free, the running tool R illustrated in FIGS. **1***a–c* can be used to set downhole components. This is accomplished by exposing passage **40** to allow pressure communication to the bottomhole assembly through the running tool R. The running tool R is simply removed by a pull which breaks the shear ring **68** to allow a pull-out force to remove the running tool R from the lower body L. Thereafter, the upper body U, attached to the lower end of the upper string **98**, is run in the wellbore with the remaining control lines **74'**. The connector self-aligns due to the action between the inclined flats **82** and **84'**. The orientation sub **112** and the crossover **86** of upper body U of the connection C are free to rotate within groove **102** to facilitate this self-alignment. The control line segments **74** are made up as a result of this alignment and the male/female connection is sealed, as explained above. More than one control line connection is made up simultaneously. As the male/female components come together in a sealed relationship, their position is locked as the collet heads **104** become trapped in the groove **120** of the tubular housing **72**. Further advancement of the mandrel **100** relative to the trapped collet heads **104** results in seal **62** engaging the seal bore **64** and locking ratchet mechanism **66**, securing the mandrel **100** to the tubular housing **72**. At this time, the production tubing is sealingly connected as the seal assembly **62** seals between the mandrel **100** and the tubular housing **72**. The control line **74**, one of which is shown in FIGS. **2***a–c*, is connected as the male and female components provide a continuous passage when sealingly connected through the boss **144** which contains the passage **80**. Thus, the control line **74** requires a connection at the lower end **146** of the boss **144**. The control line from the surface **74'**, as seen in FIG. **2***a*, also has a connection to upper end **116** of orientation sub **112**. Thus, when the male and female components are interconnected as described above, a continuous sealed passage is formed, comprising of passages **114**, **88**, and **80**, which extends from the upper end **116** of orientation sub **112** to the lower end **146** of boss **144**.

Multiple connectors C can be used in a given string, and the control lines **74** can have outlets at different locations in the well. One of the advantages of using the connector C is that the bottomhole assembly can be run into the well and fully tested along with its associated control lines while the production tubing can be installed at a later time with the remainder of the control line back to the surface. The control line in one application can run from the surface and be connected downhole, as previously described. The control line **74** can continue through a packer through a passage such as **132**. Generally speaking, the control line **74** will have a connection immediately above the packer. In multiple packer completions, since it is known what the distance between one packer and the next packer downhole is going to be, a predetermined length of control line can extend out the lower end **134** when the packer shown in FIG. **3** is sent to the wellsite. The rig personnel simply connect the control line **74** extending out the lower end **134** to the next packer below, and the process is repeated for any one of a number of packers through which the control line **74** must pass as it goes down the wellbore before making a turn to come right back up to the surface. One application of such a technique is to install fiber optic cable through the control line so that the fiber optic cable F can extend from the surface to the bottomhole assembly and back up again. Through the use of the fiber optic cable, surface personnel can determine the timing and location of temperature changes which are indicative of production of undesirable fluids. Therefore, on a real-time basis, rig personnel can obtain feedback as to the operation of downhole valves or isolation devices to produce from the most desirable portion of the well and minimize production of undesirable fluids. Fluid pressure can be used to insert or remove the fiber optic cable. There are numerous other possible uses for this technology to be used with other than fiber optic cable without departing from the spirit of the invention.

Those skilled in the art will appreciate that the orientation of the male/female components to connect the control line **74** downhole can be in either orientation so that the male component is upwardly oriented or downwardly oriented without departing from the spirit of the invention. The invention encompasses a connector which can be put together downhole and which is built in a manner so as to allow control line testing, as well as functioning of bottomhole components, without having run the upper string and its attendant control line. Thus, it is also within the scope of the invention to connect the control line to the upper string in a multitude of different ways as long as the connection can be accomplished downhole and the connection is built to facilitate the testing of the control line adjacent the bottomhole components, as well as the subsequent operation of the necessary bottomhole components, all prior to inserting the upper string. Those skilled in the art will appreciate that the preferred embodiment described above illustrates a push-together technique with an orientation feature for the control line segment of the joint. However, different techniques can be employed to put the two segments of the connector together downhole without departing from the spirit of the invention.

Any number of different pressure-actuated components can be energized from the control line **74**, such as plugs, packers, sliding sleeve valves, safety valves, or the like. The control line, since it runs from the surface down to the bottomhole assembly and back to the surface, can include any number of different instruments or sensors at discrete places, internally or externally along its path or continuously throughout its length, without departing from the spirit of the invention. As an example, the use of fiber optic cable from the surface to the bottomhole assembly and back to the surface is one application of the control line **74** illustrated in the invention. Any number of control lines can be run using the connector C of the present invention. Any number of connectors C can be employed in a string where different control lines terminate at different depths or extend to different depths in the wellbore before turning around and coming back up to the surface.

The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made without departing from the spirit of the invention.

What is claimed is:

1. An apparatus for downhole testing, from the surface, of at least one control line adjacent a downhole tool assembly comprising:

at least one tubular housing connectable to the downhole tool assembly, said at least one tubular housing comprising at least one exterior connection connected to said at least one control line which extends toward the downhole tool assembly;

a running tool having an interior defined by a wall and connectable to said at least one tubular housing to allow said at least one tubular housing with said at least one control line and the downhole tool assembly to be run to a desired location downhole, said running tool in fluid communication with said at least one exterior connection through an opening in said wall so as to allow a pressure test at said desired location through said running tool of said at least one control line which extends from said at least one exterior connection.

2. The apparatus of claim **1**, wherein:

said at least one exterior connection comprises one half of a male female push in connection, said running tool comprising the other half of said male female connection whereupon makeup of said male female connection, the interior of said running tool is in fluid communication with said at least one control line through said at least one exterior connection.

3. The apparatus of claim **2** further comprising:

an upper housing having the same portion of said male female connection as said running tool, said upper housing insertable downhole after removal of said running tool, said upper housing connected to a control line segment which extends from the surface to the portion of the male female connection on said upper housing, whereupon makeup of said male female connection said at least one control line extends from the surface past said at least one tubular housing and toward the downhole tool assembly.

4. The apparatus of claim **3** wherein:

said upper housing and said at least one tubular housing comprise an alignment device to insure proper orientation of each said connection before they can be pushed together downhole.

5. The apparatus of claim **4**, further comprising:

a locking mechanism which engages after insertion of said male portion into said female portion of each said connection to selectively hold them together.

6. The apparatus of claim **5**, wherein:

said upper housing is selectively, releasably, sealingly locked to said at least one tubular housing.

7. The apparatus of claim **1**, further comprising:

at least two exterior connections on said at least one tubular housing, said at least one control line extending from one of said at least two exterior connections to or through at least part of the downhole tool assembly and terminating at another exterior connection on said at least one tubular housing, whereupon said running tool in fluid communication with said at least two exterior connections can pressure test a U-shaped portion of said at least one control line between said at least two exterior connections.

8. The apparatus of claim **7**, further comprising:

at least one upper housing comprising at least one pair of control lines connected to it which extend from the surface, said at least one upper housing insertable downhole after removal of said running tool to connect said at least one pair of control lines respectively to said at least two exterior connections on said at least one tubular housing downhole so as to provide at least one continuous control line from the surface beyond said at least one tubular housing and back to the surface.

9. The apparatus of claim **8**, further comprising:

at least two tubular housings spaced from each other and assembled to the downhole tool assembly;

a plurality of pairs of control lines connected from said surface to said at least one upper housing and extending to different locations downhole by a connection on at least one of said at least two tubular housings.

10. The apparatus of claim **1**, further comprising:

an upper housing having at least one control line connected to it which extends from the surface, and terminates in an exterior connection, said upper housing insertable downhole after removal of said running tool, whereupon said at least one exterior connection of said at least one tubular housing and said upper housing sealingly engage downhole to extend said at least one control line from the surface past said at least one tubular housing and toward the downhole tool assembly.

11. The apparatus of claim **10**, further comprising:

at least one signal transmitting cable disposed in said at least one control line extending from the surface to beyond said at least one tubular housing.

12. The apparatus of claim **11**, wherein:

said upper housing comprises at least a pair of control lines extending from the surface and terminating at least a pair of external connections on said upper housing;

said at least one tubular housing comprising at least one pair of exterior connections between which extends a control line forming a generally U-shaped and extending downward toward the downhole tool assembly;

said at least one signal transmitting cable comprises a fiber optic cable extending from the surface through said at least one control line downhole and back to the surface.

13. An apparatus for downhole testing, from the surface, of at least one control line adjacent a downhole tool assembly comprising:

at least one tubular housing connectable to the downhole tool assembly, said at least one tubular housing comprising at least one exterior connection connected to said at least one control line which extends toward the downhole tool assembly;

a running tool having an interior defined by a wall and connectable to said at least one tubular housing to allow said at least one tubular housing with said at least one control line and the downhole tool assembly to be run to a desired location downhole, said running tool in fluid communication with said at least one exterior connection through an opening in said wall so as to allow a pressure test at said desired location through said running tool of said at least one control line which extends from said at least one exterior connection;

said running tool further comprises a valve which, in a closed position, facilitates pressurization of said at lest one control line and, in an open position, allows pressure to be transmitted through said at least one tubular housing to operate the downhole tool assembly.

14. The apparatus of claim **13**, wherein: said running tool is sealingly engaged to said at least one housing.

15. The apparatus of claim **14**, wherein:

said running tool is releasably engaged to said tubular housing.

16. A method of testing at least one control line downhole comprising:

connecting a tubular housing to a downhole tool assembly, said tubular housing having at least one external control line and at least one connection for said at least one control line;

connecting a running tool to said tubular housing;

providing fluid communication through said running tool into said external control line;

connecting tubing to said running tool;

running in said running tool on said tubing;

pressure testing the at least one external control line extending downhole from said tubular housing through said running tool.

17. The method of claim **16**, further comprising:

removing the running tool;

connecting at least one upper control line with an end connection to an upper housing;

running in said upper housing and upper control line on tubing;

joining downhole said end connection on said at least one upper control line to said connection on said tubular housing.

18. The method of claim **17**, further comprising:

extending a signal cable from the surface through said at least one upper control line and into said at least one external control line, extending from the tubular housing and toward the downhole tool assembly.

19. The method of claim **18**, further comprising:

providing at least one pair of upper control lines each ending in an end connection externally to said upper housing;

providing said at least one control line on said tubular housing in a generally U-shape with at least a pair of connections on said tubular housing;

providing an alignment feature between said housings so as to align connections between them;

moving said housings together to selectively sealingly secure said aligned connections;

running at least one fiber optic cable as said signal cable from the surface, down through one said at least one upper control line, past said tubular housing through said at least one control line connected to it, and back to the surface through another said at least one upper control line on said upper housing.

20. A method of testing at least one control line downhole comprising:

connecting a tubular housing to a downhole tool assembly, said tubular housing having at least one external control line and at least one connection for said at least one control line;

connecting a running tool to said tubular housing;

providing fluid communication through said running tool into said external control line;

connecting tubing to said running tool;

running in said running tool on said tubing;

pressure testing the at least one external control line extending downhole from said tubular housing through said running tool;

opening a valve in said running tool after said pressure testing;

operating a portion of the downhole tool assembly through said running tool.

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